Volume 22 Study G-I-C

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING OF KENAI PENINSULA, AND COOK INLET DRAINAGES AND FISH STOCKS

by

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Job No. G-I-C Inventory and Cataloging of Kenai Peninsula, and Cook Inlet Drainages and Fish Stocks
By: Stephen L. Hammarstrom

LIST OF FIGURES

TABLE OF CONTENTS (Cont'd.)

LIST OF TABLES

Volume 22 Study No. G-I

RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations of Alaska

Project: F-9-13

Study No.: G-I Study Title: INVENTORY AND CATALOGING

Job No.: G-I-C Job Title: Inventory and Cataloging of Kenai Peninsula, and Cook Inlet Drainages and Fish Stocks

Cooperator: Stephen L. Hammarstrom

Period Covered: July 1, 1980 to June 30, 1981.

ABSTRACT

Relative growth and survival rates, determined by fall gill-netting, are presented for rainbow trout, Salmo gairdneri Richardson, coho salmon, Oncorhynchus kisutch (Walbaum) and Dolly Varden, Salvelinus malma (Walbaum), captured in managed area lakes. Pertinent historical data regarding stocking, size, time, densities and catch rates are examined for various stocked lakes.

Creel census activities on 64.4 kilometers (40 miles) of the Kenai River resulted in an estimated harvest of 47,592 fish in 103,460 man-days of effort. Harvest estimates for coho salmon, sockeye salmon, Oncorhynchus nerka (Walbaum), pink salmon, Oncorhynchus gorbuscha (Walbaum), rainbow trout, and Dolly Varden are presented. Angler effort during June and July was directed primarily toward chinook salmon, Oncorhynchus tshawytscha (Walbaum), although other species are harvested incidentally. After August, effort was directed toward coho salmon.

It was estimated that anglers fished a total of 15,157 man-days on Anchor River during the period July 1November 15, 1980. The harvest was estimated to include: 6,904 Dolly Varden; 2,645 coho salmon; 309 pink salmon; 847 steelhead; 12 rainbow trout; and 57 fish of other species.

Life history data were obtained for juvenile coho and chinook salmon captured in an "inclined-plane" downstream migrant trap. The peak of the coho salmon smolt migration appears to have occurred prior to the first week in June with the peak size of smolts in the 95-99 millimeter length interval. Peak numbers of chinook salmon smolts were captured during the week of July 20, and most of the smolts ranged from 80 to 90 millimeters in length.

BACKGROUND

A map showing the location of the study area is presented in Figures 1 and 2, and a list of species of fish is presented in Table 1.

Stocked Lake Evaluation

Since statehood, an ongoing program to provide angling opportunities in easily accessable lake waters has utilized artificially reared or transplanted fish. Survey data have been analyzed with regard to: need for additional angling opportunity; potential of a given water to sustain desired species; status, condition and composition of existing populations; and requirements for rehabilitation or enhancement.

Historically, rainbow trout and coho salmon have been the predominant species used for stocking. Sockeye salmon and Arctic grayling have also been used when these species were available.

During the last few years, the state has been attempting to establish its own native brood stock of rainbow trout. Fish from the Swanson River were selected after testing against two other stocks. There have been difficulties with the program and, as a result, rainbow trout have not been available for stocking, and coho salmon have been substituted in a number of lakes. Only one lake was stocked with rainbow trout in 1978, none in 1979 and two in 1980.

Stocked populations are sampled each fall and the data obtained are used to determine relative survival, growth rates and future stocking densities. In addition, data gathered are forwarded to researchers in the Matanuska Valley where work evaluating native Alaskan rainbow trout brood stock is being conducted.

Skilak Lake Rainbow Trout

Since 1976, mild winter conditions have prevailed on the Kenai Peninsula. The Kenai River, at both its inlet to and outlet from Skilak Lake, has attracted more and more anglers in search of large rainbow trout. Fish up to 8.2 kg (18 lbs) have been reported. As this fishery became more popular, the public became more concerned that the population was being overharvested. The Department of Fish and Game conducted a creel census in 1979 (Wallis and Hammarstrom, 1980) and determined that neither harvest nor effort warranted additional census activities.

The Board of Fisheries decided to restrict this fishery by making the Kenai River, from its confluence with Moose River upstream to Kenai Lake, a single hook artificial lure area from January 1 through May 31.

An attempt was made in 1980 to capture and tag rainbow trout at the outlet of Skilak Lake, but insufficient numbers were collected to conduct a statistically valid population estimate.

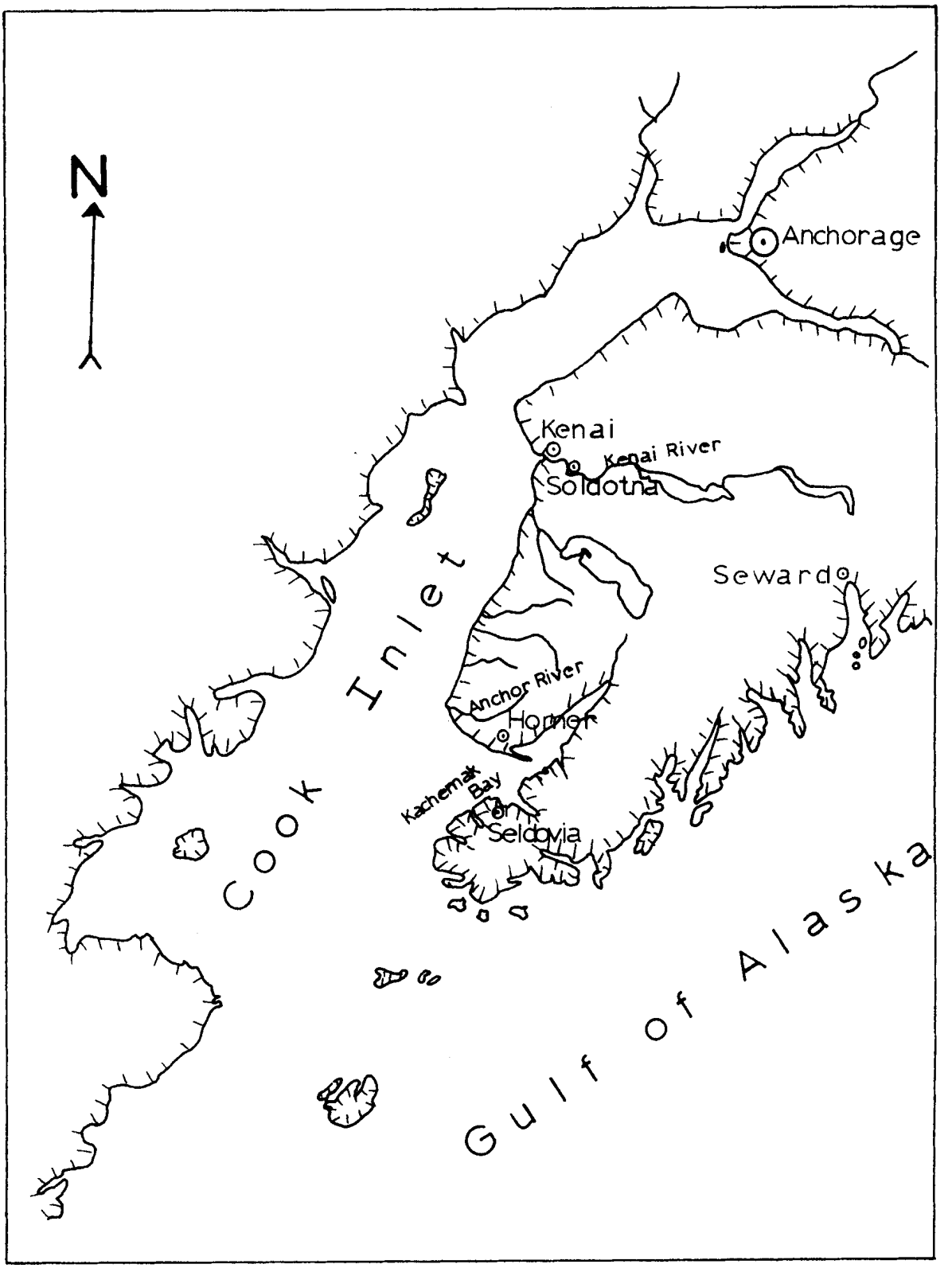

Fig. 1. Vicinity Map Showing Location of the Study Area.

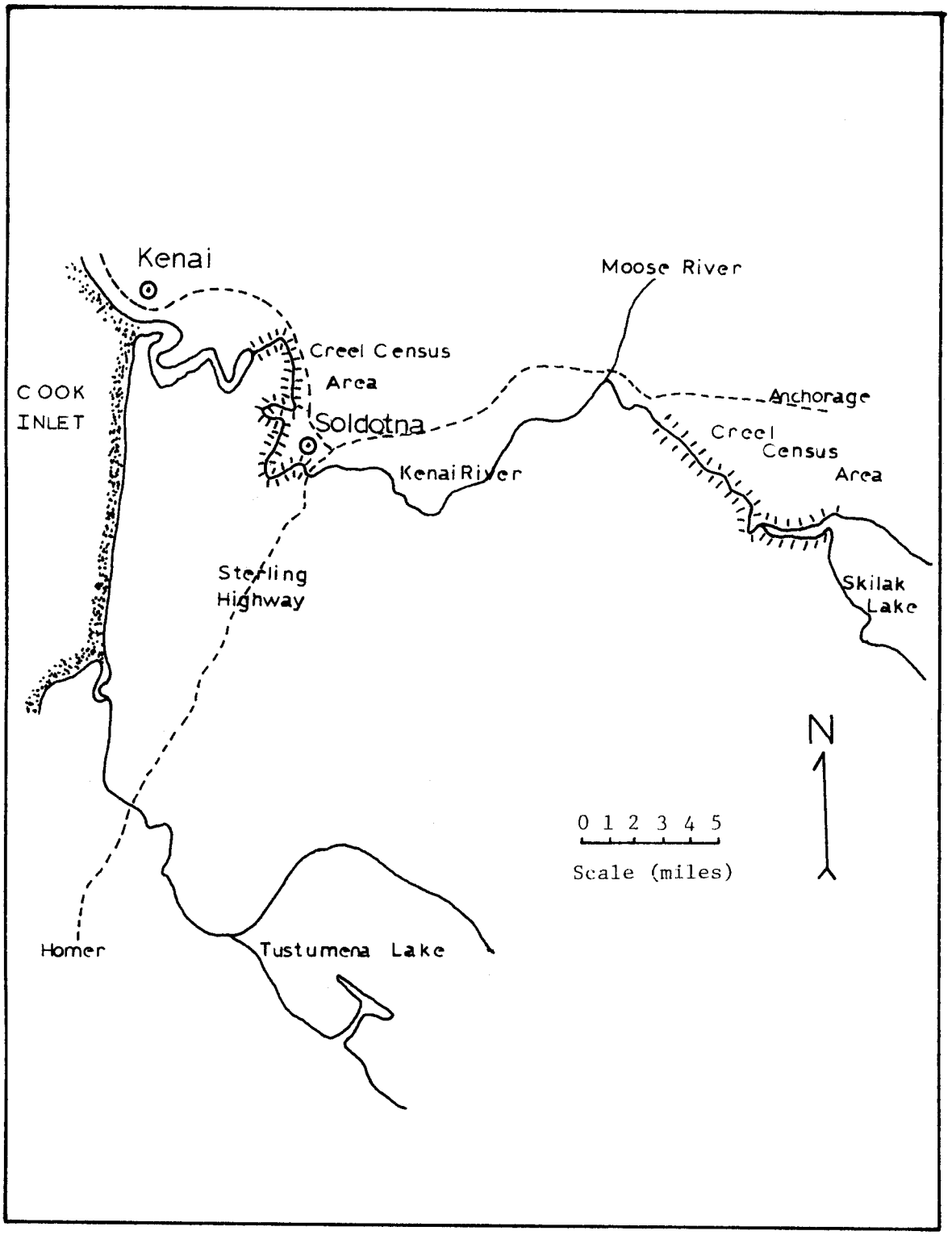

Fig. 2. Map Depicting Creel Census Areas on the Kenai River.

Table 1. List of Common Names, Scientific Names and Abbreviations.

Common Name	Scientific Name & Author	Abbreviation
Pink salmon	Oncorhynchus gorbuscha (Walbaum)	PS
Chinook salmon	Oncorhynchus tshawytscha (Walbaum)	KS
Chum salmon	Oncorhynchus keta (Walbaum)	CS
Coho salmon	Oncorhynchus kisutch (Walbaum)	SS
Sockeye salmon	Oncorhynchus nerka (Walbaum)	RS
Dolly Varden	Salvelinus malma (Walbaum)	DV
Lake trout	Salvelinus namaycush (Walbaum)	LT
Rainbow trout	Salmo gairdneri Richardson	RT
Steelhead trout	Salmo gairdneri Richardson	SH
Arctic grayling	Thymallus arcticus (Pallas)	GR
Threespine stickleback	Gasterosteus aculeatus Linnaeus	TST

Kenai River Creel Census

The creel census on the Kenai River was initiated in 1974. Initially, the target species was chinook salmon; however, information gathered that first year demonstrated that anglers shifted their emphasis from chinook salmon to coho salmon after the chinook salmon season closes (July 31).

The fishing techniques also change from those primarily of a drift fishery to those of a stationary bait or casting fishery. Although most anglers still use boats, they usually run to a favorite spot, anchor and either fish roe or toss various lures. Fishing continues through September unless poor weather or high water levels prevail.

The coho salmon run into the Kenai River is comprised of early and late segments. The early run enters the stream in late July, peaks in early August and is present until late August. The late run usually enters in late August and is present until freeze-up, with peak fishing occurring in mid-September.

Prior to 1978, both runs were harvested commercially, primarily by the set net fishery occurring on the eastern shores of Cook Inlet (statistical areas 244-20, 30, 40). A decision by the Board of Fisheries in 1978 set the commercial closing date in this portion of Cook Inlet at August 15.

In 1978, legislation was passed giving subsistence priority use of the fishery resources. Prior to 1978, a small subsistence fishery had taken place along the east side of Cook Inlet. The fishery grew to nearly 600 household permits in 1980 and, as a result, the Board of Fisheries is currently considering a screening process that would allow the growth of the fishery to be controlled.

Anchor River Creel Census

Anchor River has long been recognized as one of the most popular sport fishing streams on the Kenai Peninsula. The river supports good populations of Dolly Varden, chinook and coho salmon. It also has the largest steelhead trout population of the five Kenai Peninsula streams which produce this species.

Observations indicated a great increase in angler effort and harvest on the river and, in 1978 and 1979, a creel census of the summer-fall sport fishery was undertaken to obtain data on harvest and population levels of Dolly Varden, coho salmon and steelhead trout.

Anchor River Life History Studies

During the course of an ongoing life history study of steelhead in Anchor River, juvenile salmonids were captured in various locations in the watershed. Fish of all species were captured, thereby providing an opportunity to obtain basic life history data for other species in addition to steelhead. These data will provide a better understanding of the stocks of fish and ultimately lead to better management techniques.

RECOMMENDATIONS

1. Adult Arctic grayling should be transported from Bench Lake to Seldovia Lake in an attempt to establish a self-sustaining population.

2. Added emphasis should be placed upon defining population characteristics of Dolly Varden in the Anchor River.

OBJECTIVES

1. To determine the environmental characteristics of the existing recreational fishery waters of the job area and to obtain estimates of existing and/or potential angler use of sport fish harvest.

2. To evaluate application of fishery restoration measures and availability of sport fish egg sources.

3. To assist as required in the investigation of public access status to the area's fishing waters and to make specific recommendations for segregation of public fishing access sites.

4. To investigate, evaluate and develop plans for enhancement of anadromous and resident fish stocks.

5. To provide recommendations for the management of sport fish resources in these waters and direct the course of future studies.

TECHNIQUES USED

Stocked Lake Evaluation and Lake Survey

The techniques for evaluating the stocked lakes were the same as those described by the Lake and Stream Manual, ADF&G (1971), Engel (1973) and Hammarstrom (1974).

Arctic grayling were captured using rod and reel in Crescent Lake and held in a floating line box until they could be transported by float plane. During transport, fish were carried in water filled plastic garbage cans supplied with oxygen for a distance of 180 km (108 mi.) to Seldovia Lake.

Kenai River Creel Census

The creel census employed on the Kenai River was based on the techniques described by Neuhold and Lu (1957) and described in detail by Hammarstrom (1977).

Effort estimates were based on two randomly selected instantaneous angler counts per day. Every weekend/holiday and 3 of 5 weekdays were sampled. Because of changing daylight hours, the fishing day ranged from 20 hours to 12 hours as follows: June and July, 20 hours; August, 16 hours; September, 12 hours. During two interview periods, the following information was collected: hours fished; catch by number and species; and specific biological data from chinook salmon, coho salmon and large rainbow trout.

As mentioned previously, the Kenai River coho salmon run is comprised of two distinct segments, early run fish and late run fish. Certain Alaska Board of Fisheries' policies pertain to these run segments; therefore, effort and harvest were calculated separately for early run and late run fish in upstream and downstream sections of the river. Previous unpublished data have shown the uncensused section of the river accounts for 9.1% as much as the two census areas; therefore, estimates from the upstream and downstream section were expanded by that factor to arrive at a total estimate of effort and harvest. Timing of the run was determined by changes in angler catch rates and size of fish captured.

Anchor River Creel Census

The Anchor River creel census was conducted during the period of July 1 through November 15, 1980. Methods employed were described in detail by Wallis and Hammarstrom (1979).

Coho salmon were captured with a beach seine and tagged with serially numbered Floy tags. Tags were recovered during the creel census of the fall sport fishery and by voluntary angler returns. The number of tag recoveries were inadequate to permit a population estimate.

Biological data (fork length, sex and scales) were collected from samples of coho salmon and Dolly Varden.

Anchor River Life History Studies

Juvenile chinook and coho salmon were captured in an "inclined-plane" downstream migrant trap. Fish were measured and scales were removed, and mounted on gummed cards and pressed on acetate sheets. Scales were read with a microfiche viewer and selected scales were photographed with a viewer-printer.

FINDINGS

Stocked Lake Evaluation

Fourteen stocked lakes in the area were sampled with variable mesh gill nets. Eight of these lakes had been previously chemically treated with emulsified rotenone to eliminate competing species, usually threespine stickleback. One lake, Jerome Lake, was rehabilitated again in 1980. This lake had remained stickleback-free, but an illegal fish stocking allowed Dolly Varden to become established. Only three of the eight lakes are currently free of stickleback.

Because of the nonavailability of either rainbow trout or coho salmon, only two lakes were stocked in 1980, Carter and Vagt Lakes. Both lakes are remote. Carter Lake is relatively high, elevation 435 m (1,486 ft), and naturally free of stickleback. Vagt Lake was rehabilitated with rotenone in 1975 and has remained free of stickleback. Neither of these lakes were sampled in 1980, but previous plants of rainbow trout have been termed successful based on reports from anglers who have regularly taken relatively large fish over 508 mm (20 inches).

Final evaluation of an experimental plant of rainbow trout from two different origins was accomplished on North Joseph Lake. In 1977, fish originating from the Swanson River on the Kenai Peninsula and Alaska Ennis, were stocked in a lake which seemed to best represent the majority of lakes on the Kenai Peninsula. The lake was not rehabilitated and thus contained stickleback, but it was not utilized by anglers to any extent. In an effort to keep the angler harvest to a minimum, no publicity regarding the program was released. Fish from each origin were marked with different ventral fin clips.

The lake was first sampled in 1978 with gill nets. Apparent survival was 3.75 times higher for the Swanson fish than the Alaska Ennis group, although the apparent growth rate was less for the Swanson group. Swanson fish increased from an average of 3.6 g at stocking to 100 g at time of sampling. Alaska Ennis fish increased from 4.4 g to 418 g during the same period. Catch per net hour was 0.090 for the Alaska Ennis fish and 0.674 for the Swanson fish.

In 1979, no fish with the Alaska Ennis mark were captured, while the catch rate for the Swanson group had dropped to 0.423 fish per net hour. The average weight of the sample had increased to 236 g per fish.

In 1980, no fish with the Alaska Ennis mark were captured. The 1980 catch rate for the Swanson group dropped to 0.140 fish per net hour, but the average weight increased to 685 g. Although the sample size is small (only three fish were captured) the size is in keeping with that found by other researchers in the Matanuska Valley who are evaluating the difference between strains of rainbow trout. Swanson River fish demonstrated slower growth rates but greater survival which, after 2 years, ultimately means more fish in the creel.

Pertinent historical data for the Kenai area lakes sampled with gill nets in 1980 are presented in Tables 2 and 3.

Kenai River Creel Census

The creel census on the Kenai River commenced June 1 and was continuous through September 30. Until July 31, the principal species harvested was chinook salmon. Other species harvested, Dolly Varden, rainbow trout, sockeye salmon, coho salmon and pink salmon, were taken incidental to chinook salmon. Data regarding chinook salmon and the associated fishery are presented in the G-II-L Report of Progress, Hammarstrom (1981).

Table 2. Summary of Recent Stocking History of Kenai Peninsula Area Lakes Sampled with Gill Nets in 1980.

Lake	Stocked	Species	Origin	Fish/ kg(lb)	Fish/Hectare (/acre)	Total Stocked
Arc	6/15/78	SS	Seward, Ak.	652(295)	630(255)	4,000
Cabin	5/24/77	RB	Ennis, Mt. Ak.	297(135)	303(122)	7,000
	7/24/79	SS	Seward, Ak.	267(121)	650(263)	15,000
Centennial	6/08/79	SS	Seward, Ak.	785(357)	610(244)	6,100
Engineer	6/08/79	SS	Seward, Ak.	785(357)	370(150)	34,250
Johnson	7/16/75	RB	Ennis, Mt.	255(116)	494(200)	17,000
	7/24/79	SS	Seward, Ak.	267(121)	580(235)	20,000
Longmare	8/16/78	SS	Seward, Ak.	323(147)	283(115)	19,698
Joseph	10/04/77	RB	Swanson River	350(159)	447(181)	4,000
Portage	7/24/79	SS	Seward, Ak.	267(121)	449(182)	5,000
Rainbow	7/03/74	RB	Winthrop, Wa.	728(331)	1,254(508)	7,600
Scout	6/15/78	SS	Seward, Ak.	652(285)	494(200)	19,000
Sport	9/15/78	RB	Tallarik Cr., Ak.	319(145)	293(119)	8,550
Sunken Island	6/06/77	RB	Tustumena Lk., Ak.	8,435(3,834)	3,971(1,608)	225,055
	6/08/79	SS	Seward, Ak.	785(357)	534(216)	30,250
Tirmore	7/16/75	RB	Ennis Mt.	365(165)	494(200)	10,400
Upper Jean	6/10/77	RS	Tustumena Lk., Ak.	9,198(4,181)	4,027(1,630)	75,000
	6/08/79	SS	Seward, Ak.	785(357)	486(197)	9,060

Table 3. Summary of Stocked Kenai Peninsula Lakes Sampled with Gill Nets in 1980.

Lake	Date Sampled	Species	Number in Sample	Catch per Hour	Length in mm Range	Length in mm Mean	Length in mm S.D.*	Weight in Grams Range	Weight in Grams Mean	Year Planted
Arc	9/23	SS	31	1.38	213-243	227	9.8	100-154	122	1978
Cabin	10/07	RB	1	0.04		453			1,166	1977
		SS	152	6.57	165-262	181	18.4	45-236	59	1979
Centennial	9/22	SS	3	0.13	164-180	170	9.0	45- 54	50	1979
Engineer	10/08	SS	45	3.94	204-270	241	12.4	100-227	150	1979
		DV	3	0.06	170-400	308	121.5	32-835	445	Unknown
Johnson	9/22	RB	1	0.02		516			2,141	1975
		SS	92	7.92	162-380	205	45.3	54-694	209	1979
Longmare	10/14	SS	7	0.27	223-261	241	12.4	118-195	145	1978
North Joseph	9/24	RB	3	0.14	371-414	391	21.7	635-744	685	1977
Portage	9/24	SS	52	2.21	150-183	171	8.1	45- 64	54	1979
Rainbow	9/19	RB	2	0.09	554-609	582	38.9	3,266-3,969	3,742	1974
Scout	9/18	SS	7	0.32	246-263	259	6.2	154-200	181	1978
Sport	10/08	RB	30	0.61	195-443	334	64.1	100-1,252	522	1978
Sunken Island	9/18	RB	10	0.47	210-330	278	42.1	82-431	259	1977
		SS	81	3.77	167-245	206	26.7	54-154	100	1979
Tirmore	10/07	RB	2	0.09	623-664	644	29.0	4,309-4,536	4,423	1975
Upper Jean	9/19	SS	10	0.47	175-270	210	30.3	64-245	118	1979

* S.D. - Standard Deviation

When the chinook salmon season closes July 31, emphasis shifts to coho salmon. Anglers that had drift fished the day before would set an anchor in a quiet area along the bank and either fish with bait, usually salmon roe, or cast for coho or pink salmon.

Early run coho are available from late July through late August. In 1980, the first coho salmon was reported July 23 and a few were reported each day until August 1 when catch rates began rising steadily in the downstream section (Beaver Creek to the Soldotna Bridge). The early run peaked in this section about August 14 and was considered present until August 31 (Figure 3). The upstream section also displayed similar timing; the early run began to show increased harvest rates the first week of August, peaked about August 20 and was considered present until August 31 (Figure 4).

The late run became available in both sections about September 1. Because of the strong return of both runs, the date is somewhat artificial. Undoubtedly there is an overlap between the two runs but, during years when both runs are strong, the timing between the end of the early run and beginning of the late run was considered available until September 30 when the census terminated.

Fish are taken into October, however, cold temperatures, inclement weather and reduced flow in the Kenai River reduces the effort to a point which makes it unjustifiable to continue the creel census. For those anglers who do venture out, fishing can be quite good but the total harvest is felt to be insignificant after September 30.

The early and late runs are normally separated by a sharp decline in the catch per hour followed by a rapid increase indicating the building of the late run. This increase is usually accompanied by a higher proportion of larger fish, again indicative of late run fish. Early run fish averaged 3.5 kg (7.7 lbs) while late run fish averaged 4.4 kg (9.7 lbs). A length-weight relationship is presented in Figure 5.

In 1980 both early and late runs were considered very strong in relation to what has been observed annually since 1975. Total harvest was estimated at 25,255 coho salmon; 15,796 from the early run and 9,459 from the late run. Effort was estimated at 32,835 man-days; 22,095 and 10,740 from the early and late runs, respectively (Table 4).

The 1980 early run harvest was 140% greater than the 1975-1979 mean and displayed a 79.6% increase over the 1979 harvest. The late run harvest was 66.2% greater than the 1976-1979 mean and 66.4% greater than last year's harvest.

Effort during the early run was 44.3% above the mean and 40.7% greater than 1979. Corresponding figures for the late run are 21.2% below the mean and 15.1% less than 1979 figures. Total effort was 13.5% greater than the historical mean, and 1980 figures was 17.2% larger than 1979 data. It is felt the excellent fishing, especially during the late run, was due in part to a curtailment of commercial set net fishing after August 15.

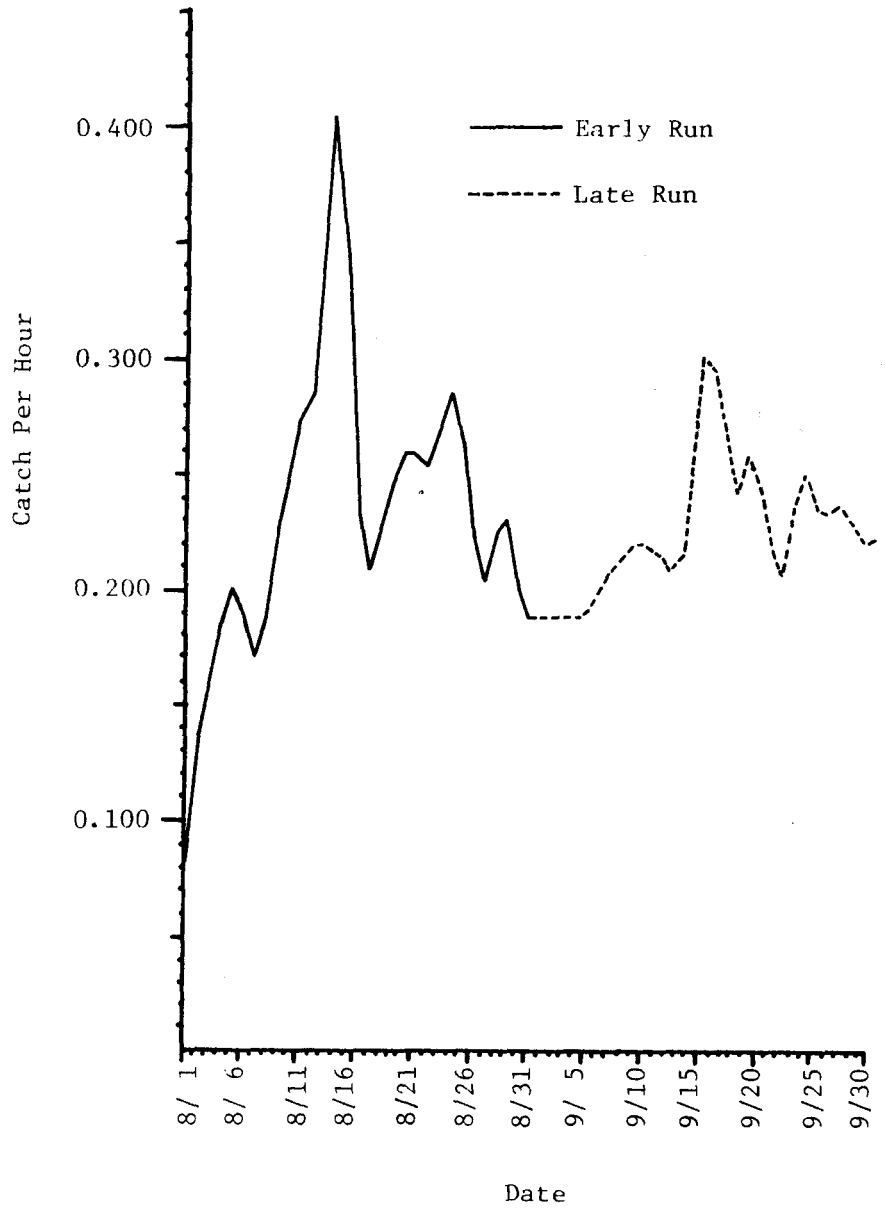

Fig. 3. Catch Per Hour by Date of Coho Salmon in the Downstream Section (Beaver Creek to Soldotna Bridge) of the Kenai River, 1980. (graph smoothed $\frac{a+2b+c}{4}$).

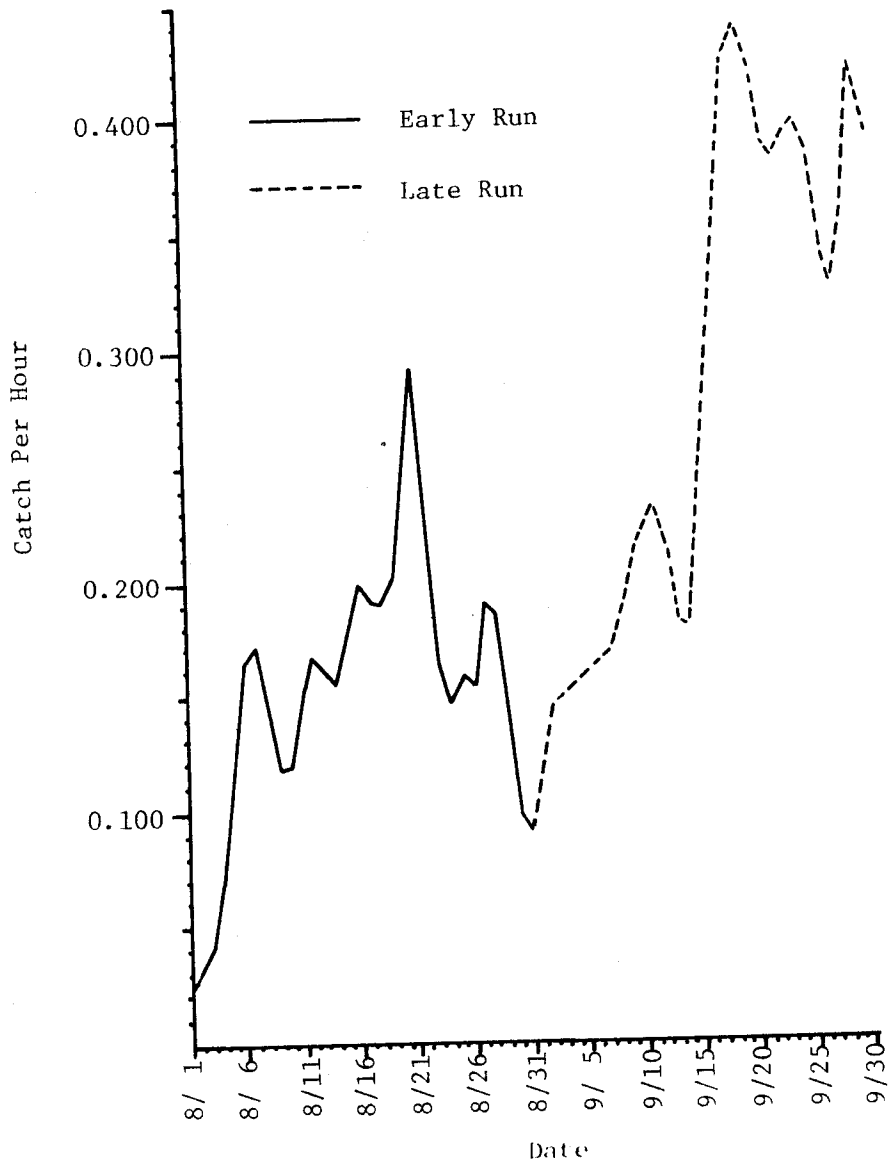

Fig. 4. Catch Per Hour by Date of Coho Salmon in the Upstream Section (Naptowne Rapids to Skilak Lake) of the Kenai River, 1980 (graph smoothed by $\frac{a+2b+c}{4}$).

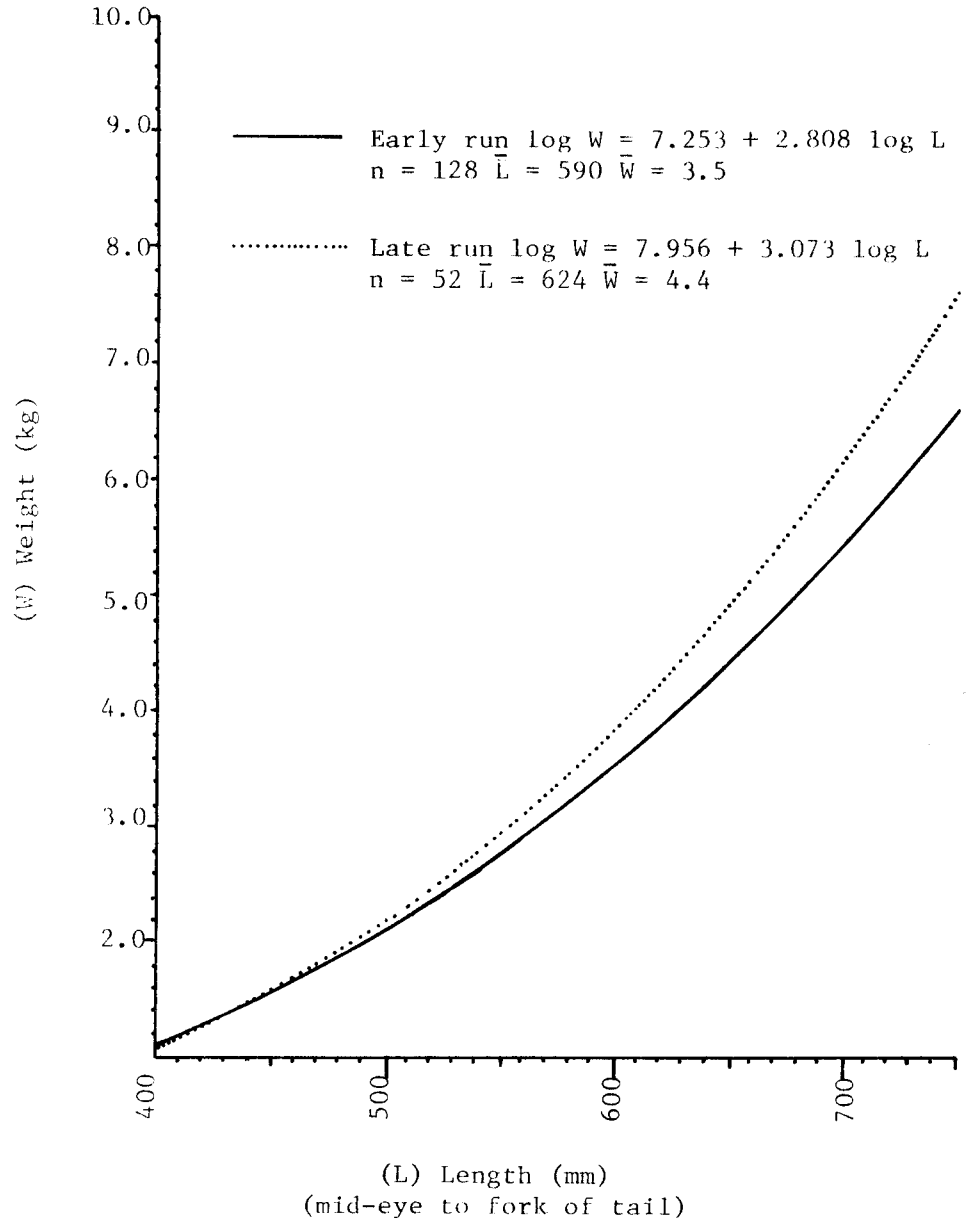

Fig. 5. Length-Weight Relationship for Coho Salmon Captured in the Recreational Fishery in the Kenai River, 1980.

Table 4. Summary of Kenai River Coho Salmon Sport Harvest and Effort, 1975-1980.

Year	Early Run Harvest	Early Run Effort	Early Run C/H	Late Run Harvest	Late Run Effort	Late Run C/H	Total Harvest	Total Effort
1975	5,715	9,725	0.091	Not Censused			-	-
1976	6,365	18,620	0.085	7,445	17,430	0.122	13,810	36,050
1977	6,780	12,520	0.123	3,280	6,630*	0.105	10,060	19,150
1978	5,225	19,965	0.058	6,360	18,140	0.100	11,585	38,105
1979	8,795	15,700	0.101	5,685	12,325*	0.123	14,480	28,025
1975-79 Mean	6,576	15,306	0.091	5,693	13,632	0.113	12,269	28,938
1980	15,796	22,095	0.184	9,459	10,740	0.251	25,255	32,835

* Angling effort reduced due to chronic flooding conditions.

Most other species in the river are harvested incidentally while fishing for chinook and coho salmon. Pink salmon enter the system in late July and are available through August. Much of the harvest on this species occurs in the vicinity of the Warren Ames Bridge which is located approximately 6.4 km (4 miles) downstream from the creel census area of the Kenai River. The estimated harvest of pink salmon in the creel census area was 7,415, representing a 56.4% decline from the 1978 season. This decrease can be explained partially by the fact that coho salmon fishing was so good that even novice anglers were reporting good catches and the less popular pink salmon was not needed to fill the creel. Additionally, people who desired pink salmon moved to that area around the Warren Ames Bridge where the concentration of fish that had only recently migrated from salt water offered excellent fishing, even for novice anglers. The true harvest estimate for pink salmon from the Kenai River will probably be better estimated by the Statewide postal survey, results of which appear in a report by Mills (1981).

Data regarding other species are presented in Tables 5 and 6. It should be noted that the overall fishing on the Kenai River in 1980, as determined by catch per hour, was better in 1980 than in 1979; that June and July were not as good in 1980 while August and September were substantially better. The August catch per hour of 0.350 (2.9 hours per fish) and the September harvest rate of 0.268 (3.7 hours per fish) were the highest recorded since the creel census was initiated in 1974.

Total effort was reduced by 23,125 man-days (18.3%) while total harvest increased by 8,047 fish (20.3%). If the "even-year only" pink salmon are not considered, the harvest was increased by only 632 fish; but in light of the 23,125 less man-days, the 1980 fishery was highly successful.

Harvest and effort were both about the historical means (Table 7), but the catch rate showed the most dramatic increase. Historically, both runs have averaged about 0.100 fish per hour (10 man-hours to catch one fish). In 1980, however, the early run was estimated at 0.184 fish per hour (5.4 man-hours/fish), while the late run was estimated at 0.251 fish per hour (4.0 man-hours per fish).

Although escapement data are available only for sockeye salmon, 464,000 as determined by sonar counters operated by the Commercial Fish Division of the Department of Fish and Game, escapement values for all anadromous species were felt to be adequate.

The harvest of rainbow trout and Dolly Varden declined in 1980 from previous years. This may be a natural fluctuation or the first indication of excessive sport harvest. A creel census conducted near the outlet of Skilak Lake in the spring of 1979 indicated a small harvest of adult rainbow trout, many of which appeared involved in spawning activity. No census was conducted in 1980 but reports from anglers suggested that few fish were available in that area. The rainbow trout situation should be more clearly defined after another year of data, but, with the restrictive fishery (single hook artificial lure only area) protecting the spawning activities, it is doubtful severe damage could be done to the adult population while they are on the spawning grounds.

Table 5. Harvest and Effort as Determined by Creel Census by Month, by Species, for the Kenai River, 1980.

Month	Effort Man-Days	Chinook Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Rainbow Trout	Dolly Varden	Total Harvest	Total Catch/hour
				Downstream Section					
June & July	44,980	3,896	-	-	-	-	-	3,896	.022
August	11,532	-	-	6,088	9,704	-	-	15,792	.391
September	5,077	-	-	-	4,091	-	-	4,091	.228
Total	61,589	3,896		6,088	13,795			23,779	.101
				Midstream Section					
June & July	10,913	883	245	-	33	190	311	1,662	.039
August	1,824	-	31	593	1,288	30	310	2,252	.353
September	888	-	-	20	781	2	28	831	.265
Total	13,625	883	276	613	2,102	222	649	4,745	.090
				Upstream Section					
June & July	14,732	775	1,238	-	165	957	1,571	4,706	.086
August	8,739	-	348	503	4,606	338	3,441	9,236	.296
September	4,775	-	-	211	4,587	24	304	5,126	.313
Total	28,246	775	1,586	714	9,358	1,319	5,316	19,068	.174
				Total					
June & July	70,625	5,554	1,483	-	198	1,147	1,882	10,264	.037
August	22,095	-	379	7,184	15,598	368	3,751	27,280	.350
September	10,740	-	-	231	9,459	26	332	10,048	.268
Total	103,460	5,554	1,862	7,415	25,255	1,541	5,965	47,592	.122

Table 6. Kenai River Historical Sport Harvest (excluding chinook salmon) and Effort Data for 1976-1978.

Year	Effort Man-days	Sockeye* Salmon	Coho Salmon	Pink Salmon	Rainbow Trout	Dolly Varden	Total Harvest
1976	80,506	719	13,808	21,443	1,797	4,957	42,724
1977	102,203	1,436	10,056	100	2,474	8,058	22,124
1978	118,307	2,180	11,585	17,011	3,118	11,695	45,589
1979	126,585	1,907	14,479	-	3,100	11,764	31,250
1980	103,460	1,862	25,255	7,415**	1,541	5,965	42,038
Mean	106,212	1,621	15,037	Not Applicable	2,406	8,488	38,404

* Sockeye salmon estimates reflect only the legal boat harvest and do not estimate the shore harvest that occurs outside the creel census area.

** Pink salmon estimates are only valid for the creel census area. A significant harvest occurs downstream from the creel census area.

Table 7. Estimated Sport Fishing Effort and Harvest from Anchor River, by Species and Weekly Intervals, July 1-November 15, 1980.

Week Ending	Total Effort Angler Hours	Estimated Harvest DV	SS	PS	SH	RT	Other
7/6	1,932	0	0	0	12	12	11
7/13	568	26	0	0	0	0	0
7/20	1,162	838	0	0	0	0	0
7/27	1,714	2,042	0	0	0	0	0
8/3	1,133	855	0	31	0	0	0
8/10	1,850	274	354	104	0	0	0
8/17	2,551	92	529	42	0	0	21
8/24	5,521	197	840	85	36	0	25
8/31	4,686	185	477	32	72	0	0
9/7	3,820	224	289	15	145	0	0
9/14	1,794	81	121	0	149	0	0
9/21	2,181	265	26	0	139	0	0
9/28	2,689	202	9	0	48	0	0
10/5	1,882	287	0	0	88	0	0
10/12	1,459	622	0	0	76	0	0
10/19	1,644	529	0	0	56	0	0
10/26	203	0	0	0	0	0	0
11/2	366	71	0	0	8	0	0
11/9	414	77	0	0	10	0	0
11/15	323	37	0	0	8	0	0
Total	37,892	6,904	2,645	309	847	12	57

Anchor River Creel Census

A creel census of the summer-fall fishery was started on July 1 and ended on November 15. A summary of estimated angler effort and harvest is presented in Table 7. A total of 3,634 anglers were interviewed, and completed anglers fished an average of 2.5 hours per day.

A summary of creel census data since 1954 from the summer-fall fishery in Anchor River is presented in Table 8. Angler effort in 1980 was reduced from that observed during the previous 3 years.

Dolly Varden first appeared in angler catches during the week ending July 13 and built to a peak during the week of July 27. A secondary peak harvest period during late August and early September was due to an increase in effort rather than increased abundance. A third peak harvest period occurred about mid-October and coincided with the Dolly Varden spawning period.

There were observable differences in the size of Dolly Varden harvested during early and late periods of the fishery, and these size differences are illustrated in Figure 6. During the early period, most of the fish are bright silver and obviously fresh from saltwater. At this time, there were many Dolly Varden caught but released due to their small size. Therefore, the length distribution shown in Figure 6 is representative of the early harvest, but not of the entire seasonal catch. In the late period, most of the fish caught were highly colored and sexually mature. Most of the fish caught after November 1 had spawned. During the late period, very few fish smaller than about 356 mm (14 inches) were caught, and the length distribution shown in Figure 6 is representative of both the catch and harvest since most fish were retained.

We have assumed that the smaller Dolly Varden which enter the river in July and August remain throughout the winter. However, we cannot explain why they do not enter the fishery during late fall. Observations during the spring fishery in 1979 and 1980 indicated most of the Dolly Varden taken were fish which had spawned the previous fall. Very few sub-adults were caught in the fishery.

The first coho salmon appeared in the census during the week of August 10 and the harvest increased to a peak during the week ending August 24. In 1980, the fishery for coho was centered in the intertidal area for a longer period and with greater intensity than in the previous 2 years.

One hundred fifteen coho salmon were tagged with Floy anchor tags, but only 10 tags were recovered and the data were not adequate to make a population estimate. The first coho salmon were tagged on August 27, which was after the peak harvest had occurred. In addition, the bulk of the harvest occurred downstream of the tagging sites.

Scales were collected from 173 coho salmon taken by anglers for age determination. The length frequency of the sample is listed in Table 9 by age classifications and sex. In the sample, 7.5% were Age 1.1, 85.5% were Age 2.1, and 6.9% were Age 3.1. The ratio of males to females was 1:0.63.

Table 8. Summary of Creel Census Data from Anchor River for Harvest of Dolly Varden, Coho and Steelhead Trout.

Year	Period Covered In Census	Effort Man-days	Dolly Varden Harvest	Dolly Varden Total Run	Coho Harvest	Coho Total Run	Steelhead Harvest	Steelhead Total Run
1954	5/29-10/23	3,000	4,000	11,500	395	1,700	247	511
1957	5/1-10/15	5,800	573	7,000	90	801	50	600
1960	5/7-10/2	5,300*	3,300	...	1,000	...	400	...
1968	7/6-10/19	3,045	4,352	...	1,149	...	102	...
1977	5/28-6/19	10,978	NC**	...	NC	...	NC	...
	Bal. of year	20,573	9,222		1,339		1,072	
	Total	31,573	9,222		1,339		1,072	
1978	5/27-6/19	23,748	NC		NC		NC	
	7/15-11/12	20,906	21,141	...	1,433	...	1,462	4,132
	Total	44,654						
1979	4/13-4/30	3,500	5,700	...	0	...	100	...
	5/26-6/18	17,715	NC		NC		NC	
	7/14-11/4	18,267	15,205	...	2,248	5,306	611	...
		39,482	20,905		2,248		711	
1980	5/24-6/16	10,109	NC	...	0	...	15	...
	7/1-11/15	15,157	6,904	...	2,645	...	847	2,388
	Total	25,266	6,904		2,645		862	

* Effort incomplete - covers period 5/7-7/14 only
** NC - not covered in census

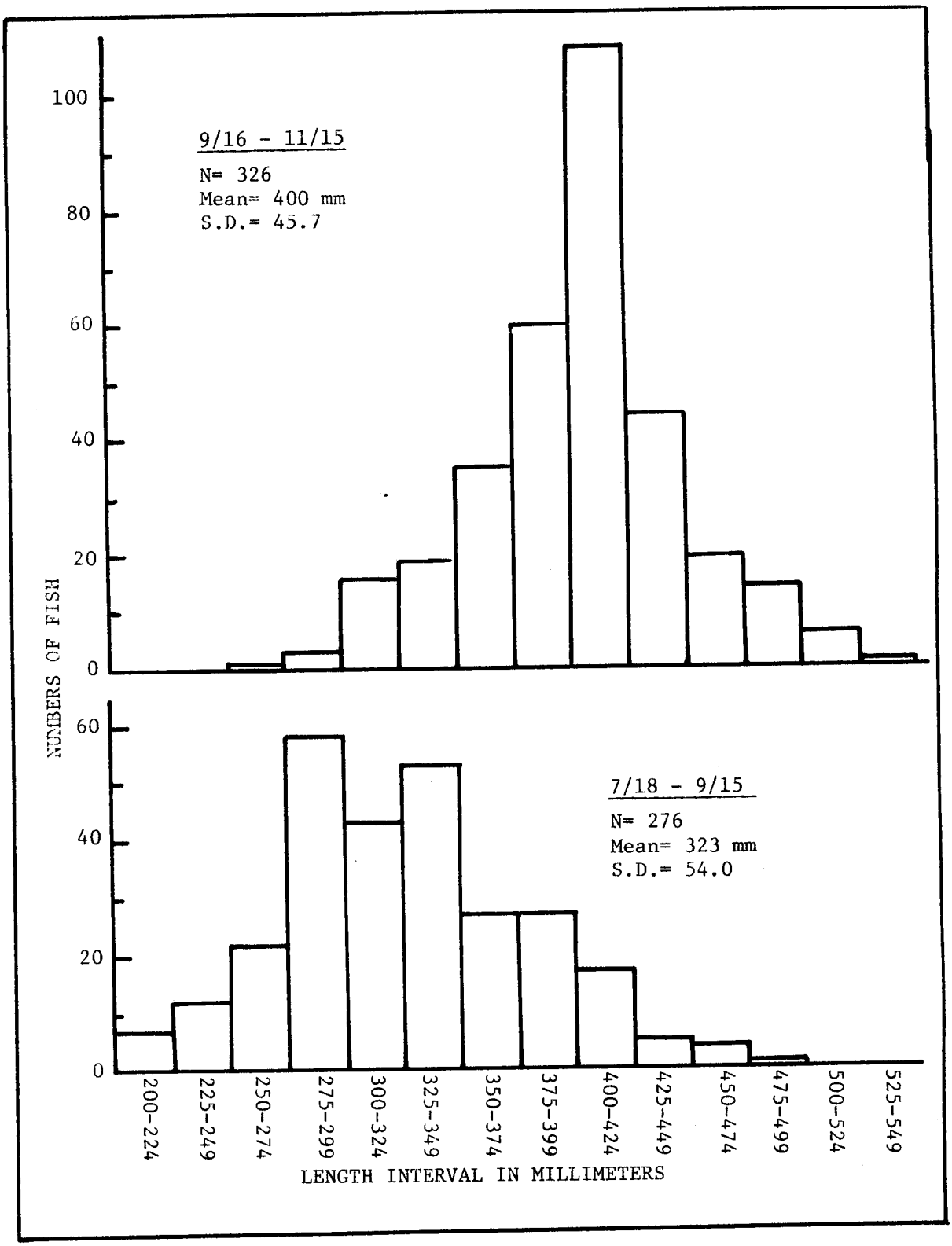

Figure 6. Length frequency of Dolly Varden harvested in the sport fishery in Anchor River during two time periods, 1980.

Table 9. Length Frequency of Coho Salmon from Anchor River, by Sex and Age Classification, 1980.

Age Classification	Females			Males		
	1.1	2.1	3.1	1.1	2.1	3.1
Length Interval (mm)						
525-549					3	
550-574		2			8	
575-599		6		2	1	
600-624	2	13	1	1	12	1
625-649	1	14		1	18	2
650-674	1	20	2	1	16	3
675-699		3			16	1
700-724	1	1		1	12	2
725-749				1	1	
750-774					2	
Number	5	59	3	7	89	9
Mean Length	639	634	640	639	649	661
S.D.	40.1	32.1	32.6	58.9	49.5	32.4

Anchor River Life History Studies

An "inclined-plane" downstream migrant trap was operated in Anchor River during the period of June 7 through September 10, 1980 as part of a steelhead life history study (Wallis and Balland, 1981). Coho salmon, chinook salmon and Dolly Varden juveniles were also captured in the trap and provide some information on time of migration and size at migration.

The sizes of juvenile coho salmon captured in the trap are listed in Table 10 by weekly periods. During the earliest period sizes, juveniles formed three modal groups at 35-44 mm, 60-69 mm and 95-99 mm. The smallest group consisted of young-of-the-year, the mid-sized group were Age I parr and the largest group consisted of both Age I and Age II fish which were designated smolts.

The maximum daily number of smolts captured was on June 7, the first day of operation, and numbers remained comparatively high until about June 20. Small numbers of smolts continued to enter the trap until late August. It is obvious the trap was not installed early enough to capture the earliest migrating smolts, and it appears that the peak smolt migration occurred during or before the first week in June.

The sizes of juvenile chinook salmon captured in the trap are listed in Table 11 by weekly period. Age of fish was determined by examination of scale samples, and the dashed line in Table 11 denotes the separation of young-of-the-year from Age I fish. There were shifts in modal lengths of fish with time, but it appears most smolts were in modal lengths from 80 to 90 mm.

Few smolts were caught during the first few days of operation. It appears that trap catches encompassed almost the entire smolt migration period. Catches were comparatively high throughout the period of June 15 through August 3, with the peak catch occurring the week ending July 20.

Kachemak Bay Feeder Chinook Salmon

Two additional tagged feeder chinook salmon were recovered in the Kachemak Bay sport fishery in 1980. One was from the Priest Rapids facility on the Columbia River in Washington, and the other from the Marion Forks Hatchery on the North Santiam River, Oregon (Table 12).

Table 10. Lengths of Juvenile Coho Captured in the Inclined Plane Downstream Migrant Trap in Anchor River, by Weekly Period, 1980.

Length Interval (mm)	Week Ending 6/8[1/]	6/15	6/22	6/29	7/6	7/13	7/20	7/27	8/3	8/10	8/17	8/24	8/31
30- 34	1	0	6	1	3	0	0	0	0	0	0	0	0
35- 39	9	8	6	4	2	0	0	0	0	0	0	0	0
40- 44	7	10	10	7	1	0	1	0	0	0	0	0	0
45- 49	1	5	9	13	8	1	1	2	0	0	0	0	0
50- 54	1	15	13	19	1	3	3	1	0	1	0	4	2
55- 59	9	31	40	39	16	5	10	7	1	2	1	4	2
60- 64	15	66	76	79	27	15	26	2	5	3	1	2	2
65- 69	6	67	81	89	36	20	71	7	6	11	4	2	3
70- 74	4	55	57	46	30	15	48	4	22	17	6	5	8
75- 79	2	25	42	39	35	6	31	2	11	17	20	9	4
80- 84	8	27	34	36	26	10	10	0	6	4	10	3	3
85- 89	17	32	35	28	28	17	3	0	3	0	5	1	0
90- 94	18	23	25	11	10	8	0	0	0	2	3	1	1
95- 99	18	31	44	5	10	4	2	0	0	1	3	0	0
100-104	19	25	25	6	0	0	1	0	0	1	0	0	0
105-109	14	9	17	7	1	0	0	0	0	1	0	0	0
110-114	3	3	17	4	1	0	0	0	0	0	0	0	1
115-119	0	3	10	2	0	0	0	0	0	0	0	0	0
120-124	5	0	4	1	0	0	0	0	0	0	0	0	0
125-129	0	2	3	1	1	0	0	0	0	0	0	0	0
130-134	0	0	1	0	0	0	0	0	0	0	0	0	0
135-139	0	0	0	0	0	0	0	0	0	0	0	0	0
140-144	0	0	0	0	0	0	0	0	0	0	0	0	0
145-149	1	0	0	0	0	0	0	0	0	0	0	0	0
Total	158	437	555	437	236	104	207	25	54	60	53	31	26

1/ Two days only

Table 11. Length of Juvenile Chinook Salmon Captured in the Inclined Plane Downstream Migrant Trap in Anchor River, by Weekly Period, 1980.

Length Interval (mm)	Week Ending 6/8[1/]	6/15	6/22	6/29	7/6	7/13	7/20	7/27	8/3	8/10	8/17	8/24	8/31	
40- 44	0	3	2	2	1	0	0	0	0	0	0	0	0	
45- 49	0	0	1	3	0	0	0	0	0	0	0	0	0	
50- 54	0	0	0	0	0	0	1	1	0	0	0	0	0	
55- 59	0	8	6	6	1	1	10	0	0	0	0	0	0	Young-of-the-year
60- 64	2	4	7	6	0	0	2	1	0	1	0	0	1	
65- 69	2	9	10	13	2	2	2	1	0	2	1	0	1	
70- 74	3	12	15	12	9	1	5	0	3	4	2	3	0	
75- 79	2	2	4	11	31	9	17	3	9	2	4	4	2	
80- 84	2	4	9	20	44	22	45	8	10	8	6	7	1	
85- 89	0	14	16	18	33	29	77	14	37	14	4	4	1	
90- 94	1	29	38	14	15	22	54	3	72	19	1	0	0	
95- 99	1	14	25	7	4	7	18	0	43	6	0	0	0	
100-104	0	14	17	3	0	1	2	0	13	4	3	0	0	
105-109	0	7	13	3	1	0	1	0	0	2	0	0	0	Age I
110-114	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	13	120	163	118	141	94	234	31	187	62	21	18	6	

1/ Two days only

Table 12. Data for Tagged Chinook Salmon Caught in Kachemak Bay Sport Fishery 1977-1980.

Date Captured	Length/ Weight	Tag Code	Brood Year	Origin
1977	Size Unknown	2-3-2	1973	Puntledge River Hatchery, British Columbia; hatchery evaluation.
9/26/78	680 mm/5.9 kg	9-5-7	1975	South Santiam River, Oregon; hatchery experimental.
9/26/78	575 mm/3.7 kg	2-4-11	1975	Nitinat River, British Columbia; wild stock contribution.
9/26/78	570 mm/3.6 kg	2-1-10	1975	Atnarko River, British Columbia; wild stock contribution.
9/30/78	825 mm/6.8 kg	9-5-8	1975	South Santiam River, Oregon; planted in Willamette River at Oregon City.
10/19/78	Lgth Unknown 2.3 kg	63-16-6	1976	Skagit River, Washington; wild stock contribution.
3/5/79[1/]	505 mm	4-16-16	1976	Crystal Lake Hatchery, Petersbury, Alaska.
5/6/79	Lgth Unknown 1.6 kg	9-16-30	1976	South Santiam River, Oregon; planted in Willamette River at Oregon City.
9/9/79	Lgth Unknown 6.8 kg	9-16-30	1976	South Santiam River, Oregon; planted in Willamette River at Oregon City.
10/6/79	760 mm/10 kg	9-5-8	1975	South Santiam River, Oregon; planted in Willamette River at Oregon City.
10/23/79	Lgth Weight Unknown	2-16-30	1976	Robertson Creek Hatchery, British Columbia.
6/7/80	Lgth Weight Unknown	63-16-62	1976	Priest Rapids, Columbia River, Washington.
9/-/80	Lgth Weight Unknown	7-12-32	1977	Marion Forks Hatchery, North Santiam River, Oregon.

1/ This individual was caught in an experimental shrimp trawl.

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